The following wording was originally a proposed changed to MIL-PRF-38534. It was never included into the specification. However, the concept may prove valuable to some manufacturers. Note: JEDEC 13.5 is currently working to update these guidelines. Their later revisions will replace this one when they become available.

1.0 Purpose: To monitor the Internal Water Vapor Content of Hermetically Sealed Devices in-line as opposed to end-of -line Internal Water Vapor test in accordance with the applicable Specification. The intent of this guideline and the benefits are:

1. Validates qualification by extension for Internal Water Vapor for similar package / substrate attach process / seal methods.
2. Will substitute periodic qualification requirements for polymeric/adhesive systems and product Internal Water Vapor requirements that use the same baseline processes and materials.
3. Prevents use of potentially unreliable product in the field due to excessive moisture.
4. Serves as an ongoing reliability monitor to understand potential failure mechanisms and process deficiencies in assembly and materials.
5. Allows substitution of data thus eliminating redundant testing for major changes in assembly processes and materials in products.

2.0 Requirements

2.1 General

2.1.1 The in-line Internal Water Vapor Process Control shall be incorporated into the manufacturers baseline and shall be approved by either the manufacturers TRB or by the Qualifying Activity. The in-line process monitor may apply to any device type called out in the applicable specification.

2.1.2 Test samples. For the purpose of in-line Internal Water, a device within 50% in volume to the hermetic device may be used in lieu of the product to simulate the baseline assembly processes, materials and seal methods. The use of electrical rejects is permissible. (i.e. If the hermetic device is 2.0cc in volume, then a similar device from 1.0cc to 3.0cc may be tested).

2.1.3 Data traceability. Data traceability for major changes to materials, assembly processes, seal profiles, equipment, baseline process qualifications, qualified package family data and Periodic Inspection (PI)/QML summaries shall be maintained.

2.1.4 Pre Audit. An internal pre audit of the overall assembly processes and materials is an optional requirement prior to performing in-line Internal Water Vapor.

2.2 **Sampling**

2.2.1 Frequency of Sample Selection.
Sample collection shall be done among different equipment of the same seal process (as applicable) and shall be rotated periodically among the different equipment.

a. If the device type or package type has received Internal Water Vapor testing at PI/QML, then one sample per month for each baseline seal process and package type shall be tested to satisfy Internal Water Vapor process control requirements.

b. If the device type or package type has not received Internal Water Vapor testing at PI/QML or the device type or package type has not been produced for more than one year, then one to three devices (based on manufacturer Internal Water Vapor History) shall be sample tested from the first build lot. If the first build lots internal water vapor is statically acceptable (see 2.3), then one sample per month for each baseline seal process and package type shall be tested thereafter to satisfy Internal Water Vapor process control requirements.

2.2.2 Sampling points. The samples shall be collected after exposure to the screening stress conditions of the screening requirements (i.e. after burn-in). Other sampling points (e.g. after seal or temperature cycle) are allowed as an alternative provided process stability is demonstrated via procedures and data (i.e. correlation between fine leak data and Internal Water Vapor Data).

2.2.3 Reduced or modified sampling. Reduced or modified sampling will be permitted when statistical process control methods are utilized to monitor seal processes and internal water vapor data is traceable and under control.

2.3 Procedures in case of discrepant data. In case of discrepant data above the allowable moisture limit during the in-line process, investigations shall be made to understand the underlying cause or reason for the variation (e.g. loss of hermeticity due to package cracking or test escape, equipment malfunction, improper Internal Water Vapor testing, process deficiencies, operator errors, etc). Additional samples from the lot shall be tested for internal water vapor after corrective measures are taken. Lot disposition shall be based on internal water vapor of the resampled device within the specified internal water vapor limits. If the analysis reveals that the failure is due to process or material deficiencies, the offending cause and source shall be corrected to bring the process under control.

2.4 Internal water vapor data substitution. In-line process Internal Water Vapor data can be utilized to satisfy the internal water vapor requirements in the following cases:

1. Retention of polymeric certification periodically as stipulated in MIL-STD-883, Test Method 5011.
2. Testing requirements for major product / process changes in accordance with the applicable specification for:
   a. Substitution of attached material / method or process temperature.
   b. Substitution of package configuration changes to lids, materials or plating.
   c. Substitution of seal method or changes to baseline seal process.
   d. Increase in seal perimeter or lead counts.
   e. Other changes that may affect Internal Water Vapor.

   In all these cases, Internal Water Vapor test data on a sample or SEC that contains those changes shall be included and retained in the process control database.
3. PI/QML testing requirements for products that utilize the same package family, polymeric/adhesive materials and seal methods.

3.0 Definitions

Baseline index of documents. The documents which establish the baseline for a given device manufacturer.

Baseline process flow. The manufacturer's baseline process flow is that flow of manufacturing process, inspection and test processes and material entry points into the flow that defines the manufacturer's specific technology flow. This flow begins with incoming materials, goes through all manufacturing processes including inprocesses monitors, completed device screening and final acceptance verification of the product.

Critical control parameters. Critical control parameters are parameters whose variability most affect a design, process, or material.

Device Type. Device type refers to a single specific device configuration. The device type is electrically and functionally interchangeable with each other; have the same electrical and environmental test limits; and use the same package, materials, piece parts, and assembly processes.

Package family. A package family is a group of package types, i.e. case outline, configuration, materials and baseline assembly processes (e.g. bathtub, platform, TO-can, cerdip, side braze).

Package type. Package which have the same case outline, configuration, materials (including bonding wire and die attach), piece parts (excluding preforms which differ only in size) and assembly processes.

Periodic capability certification. Periodic capability certification is the calibration and certification of equipment and/or process steps for an individual parameter(s) such that it can be used as an alternative method to detection testing.

Production lot. A production lot consists of a device type manufactured from the same basic raw materials on the same production line, processed under the same manufacturing techniques and controls using the same type of equipment.

Qualifying activity. The qualifying activity is the organizational element of the Government that grants certification and QML status.

Standard evaluation circuit (SEC). A SEC is a test coupon/device that is representative of actual product. The SEC may be actual product or may be specifically designed to evaluate a particular process. The SEC should be processed using the same processes, and type of material as a product it represents.